

WISCONSIN FOREST MANAGEMENT GUIDELINES

PUB-FR-226 2003



Wisconsin Department of Natural Resources
Division of Forestry
PO Box 7921
Madison, Wisconsin 53707

For additional information, call **608-267-7494** or visit our web site at:
www.dnr.state.wi.us/org/land/forestry/

October, 2003

This document is intended solely as guidance, and does not include any mandatory requirements except where requirements found in statute or administrative rule are referenced. This guidance does not establish or affect legal rights or obligations, and is not finally determinative of any of the issues addressed.

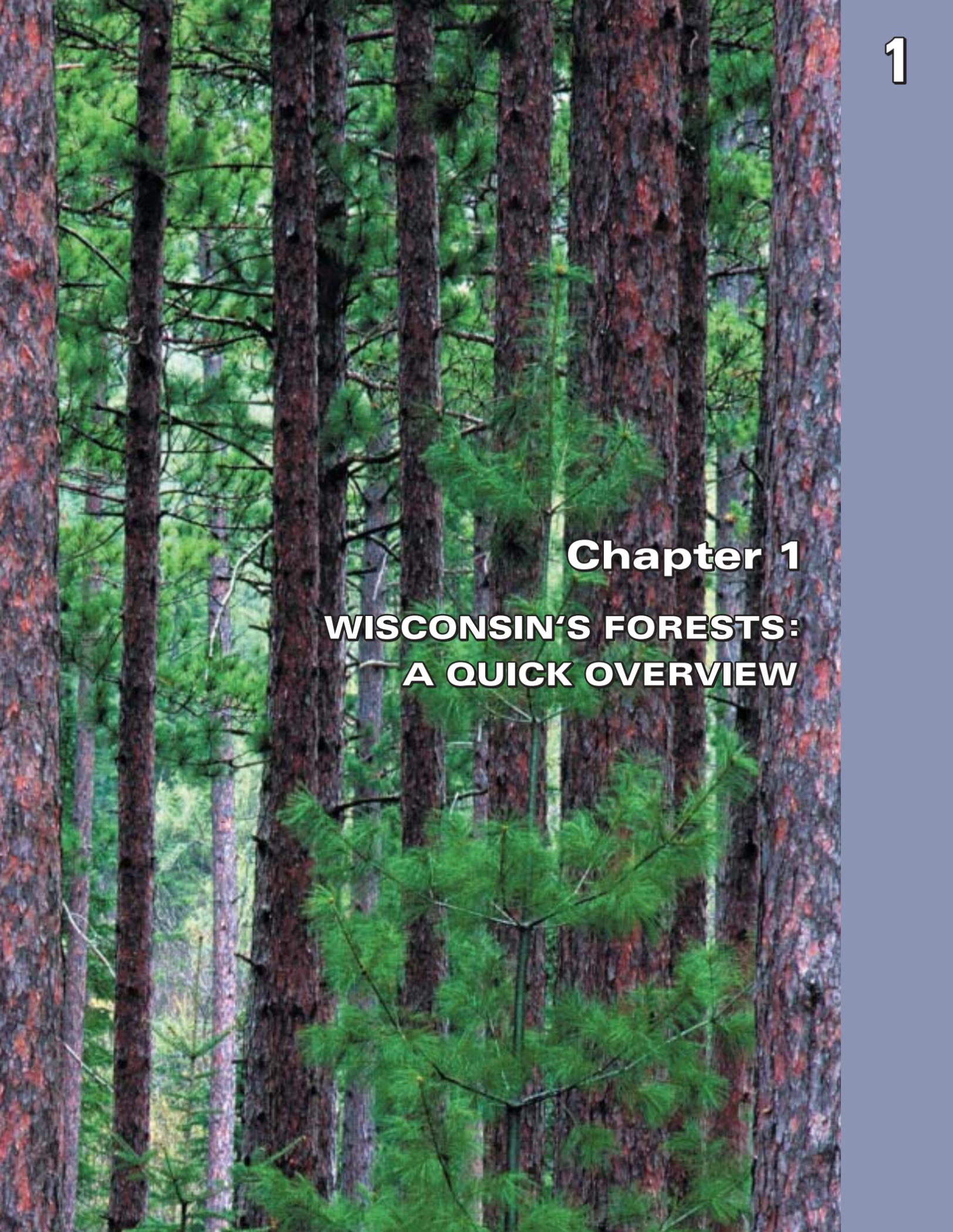
This guidance does not create any rights enforceable by any party in litigation with the State of Wisconsin or the Department of Natural Resources. Any regulatory decisions made by the Department of Natural Resources in any manner addressed by this guidance will be made by applying the governing statutes and administrative rules to the relevant facts.

The Wisconsin Department of Natural Resources provides equal opportunities in its employment, programs, services, and functions under an Affirmative Action Plan. If you have any questions, please write to **Equal Employment Opportunity Office, Department of Interior, Washington, D.C. 20240.**

This publication is available in alternative format upon request.

Please call **608-267-7494** for more information.





Chapter 1
WISCONSIN'S FORESTS:
A QUICK OVERVIEW

CHAPTER 1 — WISCONSIN'S FORESTS: A QUICK OVERVIEW

A STATEWIDE SNAPSHOT OF WISCONSIN'S FORESTS.....	2
Wisconsin's Forests	2
Forest Area	2
Forest Types.....	3
Number of Trees	4
Timber Volume.....	4
Growth and Removals.....	5
Economic Importance.....	5
Biodiversity	5
Ownership.....	6
Urban Forests	6
A BRIEF HISTORY OF WISCONSIN'S FORESTS.....	7
Forests Before European/American Settlement	7
Forests Since European/American Settlement	9



A STATEWIDE SNAPSHOT OF WISCONSIN'S FORESTS*

Wisconsin's Forests

Wisconsin's forest resources can be divided into two broad categories, the Northern Mixed Forest and the Southern Broadleaf Forest. These two forest types exist in Wisconsin because they have adapted to the different soil types and climates that have supported them over thousands of years.

These two regions meet in an area called the tension zone. The tension zone stretches across Wisconsin from northwest to southeast in an S-shape. The tension zone forms the northern boundary of many species' ranges,

both plant and animal. From Polk and St. Croix counties southeast to Milwaukee, the tension zone divides the state into the two major ecological regions. The northern region, the Northern Mixed Forest, is more closely related to the forest of northeastern Minnesota, northern Michigan, southern Ontario, and New England. The southern region, the Southern Broadleaf Forest, is warmer and generally considered closer, ecologically, to the forests of Ohio and Indiana. The tension zone is a diverse area, where representative plant and animal species from both the Northern Mixed Forest and the Southern Broadleaf Forest types can be found, as well as a significant shift in vegetation.

Forest Area

Of Wisconsin's 35 million acres of land, about 16 million acres are forested. Forest area in Wisconsin has been steadily increasing since 1968, mostly due to the conversion of marginal agricultural land back into forests. Currently, forest covers

about 46 percent of the total land area of the state. Since 1983, forestland has increased about

four percent, or 640,000 acres. Most of this accounted for in the northern area of the state. Forests from 20 to 80 years of age experienced the largest increase in acreage.

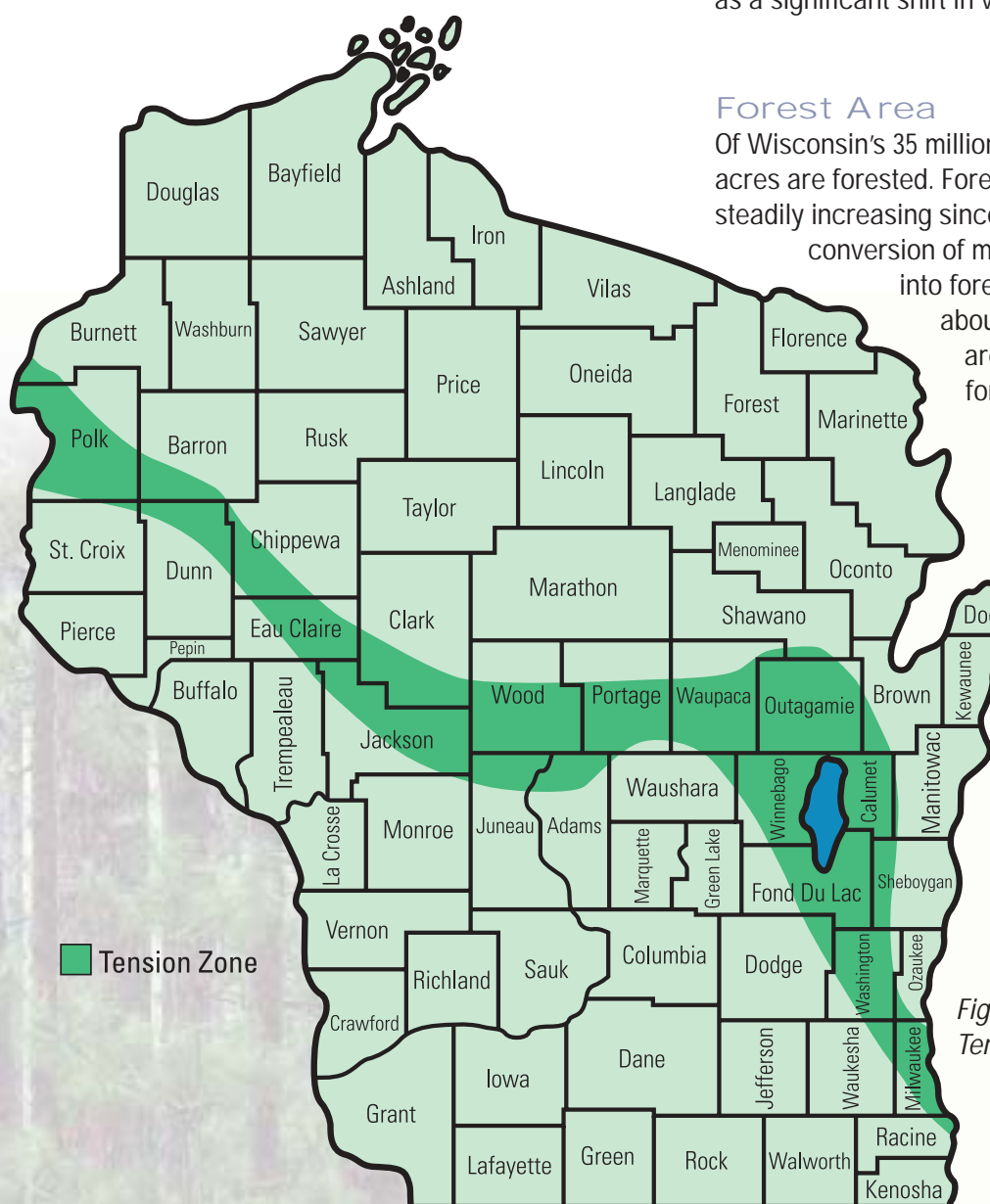


Figure 1-1: Wisconsin's Tension Zone

* Note: The information in this chapter was taken from *Wisconsin Forests at the Millennium: An Assessment*. November 2000. Wisconsin Department of Natural Resources Division of Forestry, publication PUB-FR-161 2000.

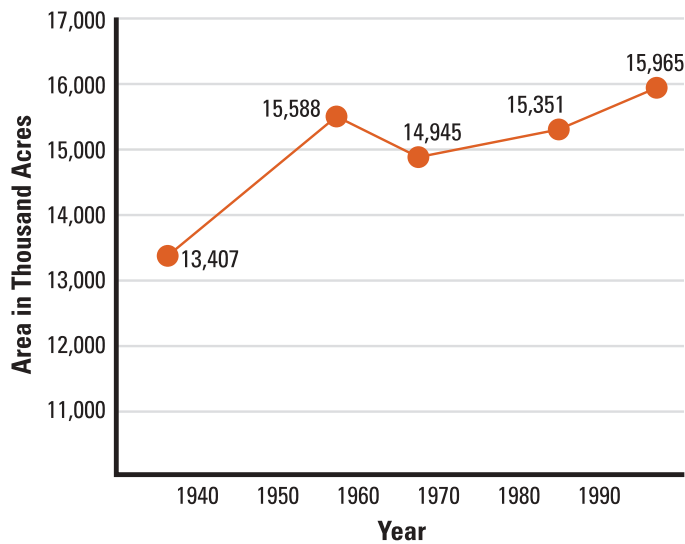


Figure 1-2: Wisconsin forest acreage over time.

Forest Types

The most abundant forest types in Wisconsin are hardwood forest types. Maple-basswood, aspen-birch and oak-hickory are the most common. Maple-basswood accounts for 5.3 million acres, followed by aspen-birch forest type with almost 3.4 million acres, and oak-hickory with about 2.9 million acres. While 84 percent of Wisconsin's forests are hardwood types, there are also significant softwood types occupying large areas, especially in the north. Red pine, jack pine, black spruce, northern white cedar, and tamarack are the most common types.

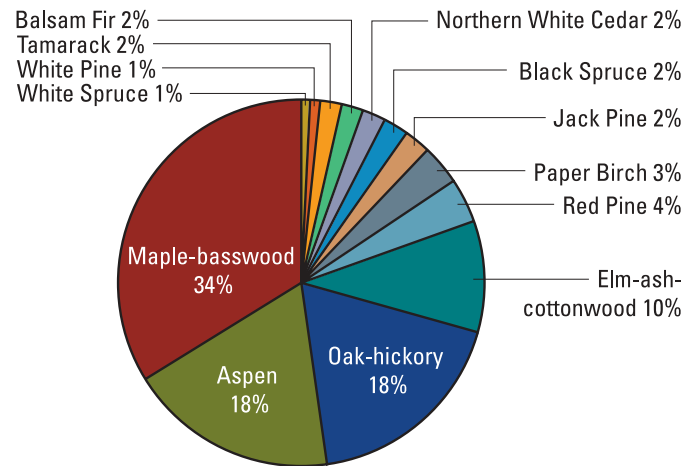


Figure 1-3: Wisconsin forest types, 1996.

Areas and relative proportion of various forest types have changed significantly over the last 70 years. Hardwood succession is very apparent. Since the first official statewide forest inventory in 1936, aspen-birch forest area has decreased steadily, although it is still much more common than at the beginning of the Cutover. The Cutover was the period of intense timber harvest in the Lake States, lasting about 40 years, from 1880 to 1920. Since 1936, maple-basswood, soft maple-ash, and oak-hickory forests have increased just as steadily. Conifer forest area has remained roughly constant over the last 70 years.

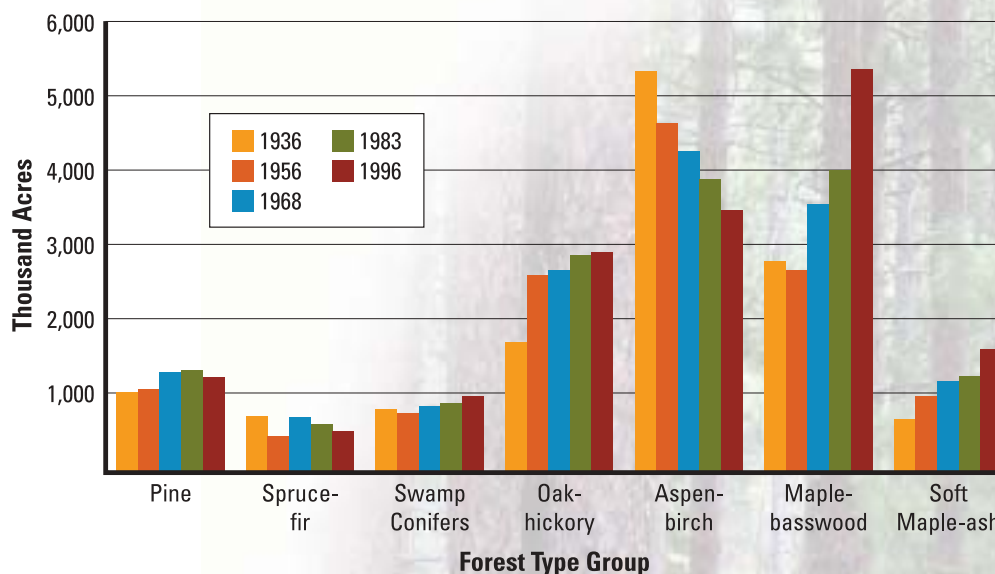


Figure 1-4: Wisconsin forest types over time.



Figure 1-5: The area of aspen-birch and other “pioneer types” has declined over the last 70 years. These sun-loving species require the open conditions created by a windstorm, fire or an even-aged harvest to regenerate and grow.

Number of Trees

Predictably, along with an increase in forest area, there has been a corresponding increase in the number of trees. Between 1983 and 1996, trees more than 10 feet tall increased by 1.4 billion individual trees. In 1996, there were 9.8 billion trees in Wisconsin.

Timber Volume

Between the 1983 forest inventory and the 1996 forest inventory, overall growing stock volume in Wisconsin's forests has increased by almost 12 percent – about two billion cubic feet. In 1996, there were 18.5 billion cubic feet of growing stock volume, of which 4.4 billion were conifer, and 14.1 billion were hardwood. Along with this overall increase, the state's maples, oaks, basswood, ashes, white and red pines, white and black spruces, and balsam fir are some of the commercially important species whose growing stock volume increased. Aspen, paper birch, and jack pine volumes decreased between inventories.

During the same period, sawtimber volume increased dramatically – by more than 30 percent or 11 billion board feet. Sawtimber is the largest timber size class. These trees tend to be older, more economically valuable, mature seed-producers, and are important to the forest's structure. As Wisconsin's forests age, continued growth of sawtimber volume is likely.

PLANTATIONS

More than 95 percent of Wisconsin's standing forests are a result of natural regeneration. The remaining 4.5 percent of Wisconsin's forests are plantations. In this context, plantations refer to areas established through planting that are sufficiently productive to qualify as timberland. The planted species is not necessarily dominant. The majority of plantations are conifer types and located in the central and northern parts of the state.



Figure 1-6: Most of Wisconsin's plantations are pine, however, they constitute only 4.5 percent of the state's total forestland.

Growth and Removals

In Wisconsin, our forests are growing at a rate that significantly exceeds harvest. Between 1983 and 1996, average net annual growth exceeded harvests and other removals by almost 158 million cubic feet. During the period between inventories, average net annual growth was 490 million cubic feet. Average annual removals were 332 million cubic feet, about 68 percent of average net annual growth. Between 1968 and 1983, average annual removals were 45 percent of average net annual growth. Average net annual growth of sawtimber in particular also exceeded average annual removals, resulting in a net increase in sawtimber volume between 1983 and 1996. Each year, on average, sawtimber volume increased 1.68 billion board feet. About 59 percent of that growth was offset by removals – 986 million board feet each year. One important measure of sustainability is that the Wisconsin timber net growth versus removals ratio is greater than one, statewide.

Economic Importance

Wisconsin's forests provide the raw materials for homes, offices, furniture, paper, medicines, paints, plastics, and many products people may not realize come from trees. In Wisconsin, more than 1,850 wood-using companies produce nearly 20 billion dollars of forest products every year. More than 300,000 Wisconsin jobs rely on the forest products industry.

Biodiversity

Wisconsin is blessed with abundant biodiversity. Located at the junction of three of North America's six biotic provinces – the eastern deciduous forest, the northern boreal forest and the temperate grasslands – we have a wealth of species and natural communities. 2,652 species of native plants and 681 species of native vertebrates have been identified in Wisconsin. In addition, there are thousands of species of nonvascular plants and invertebrates. The challenge is to manage this diversity to conserve Wisconsin's heritage and preserve future management options (*Wisconsin DNR Biodiversity as a Management Issue 3*).

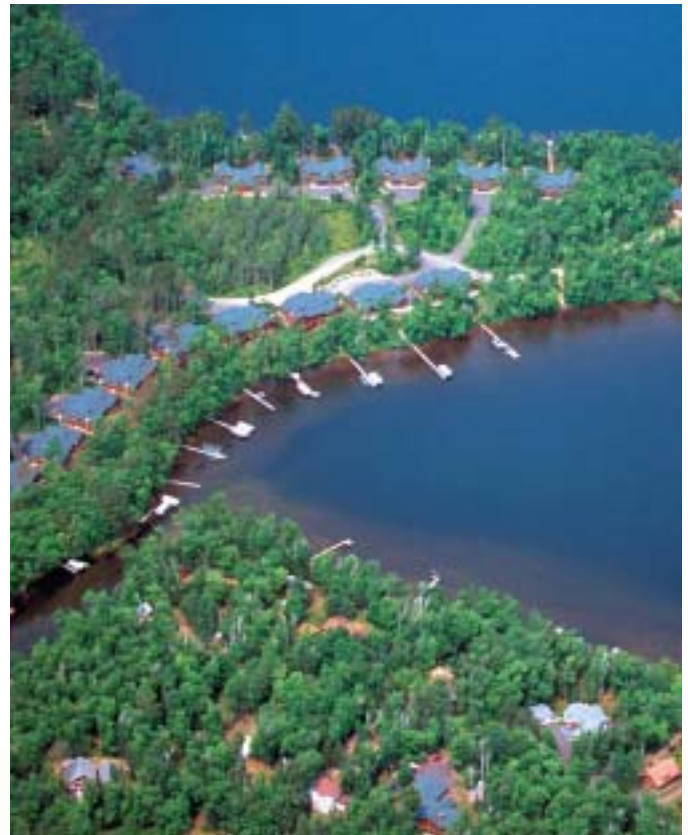


Figure 1-7: Continued lakeshore development is influencing Wisconsin forests.

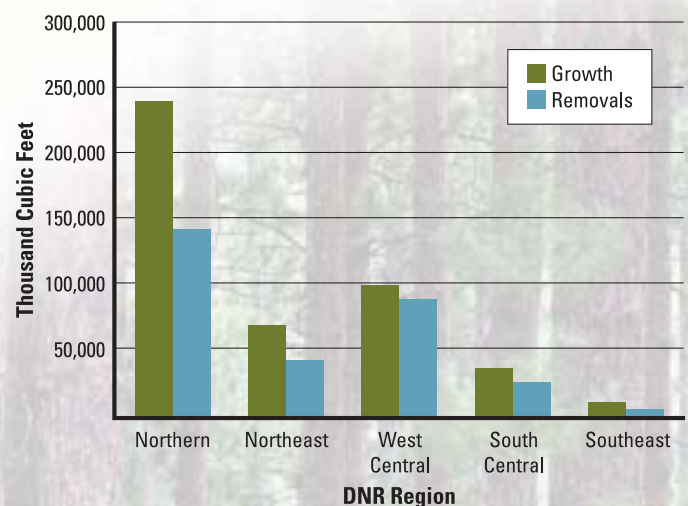


Figure 1-8: Bar graph showing growth and removal by DNR regions.

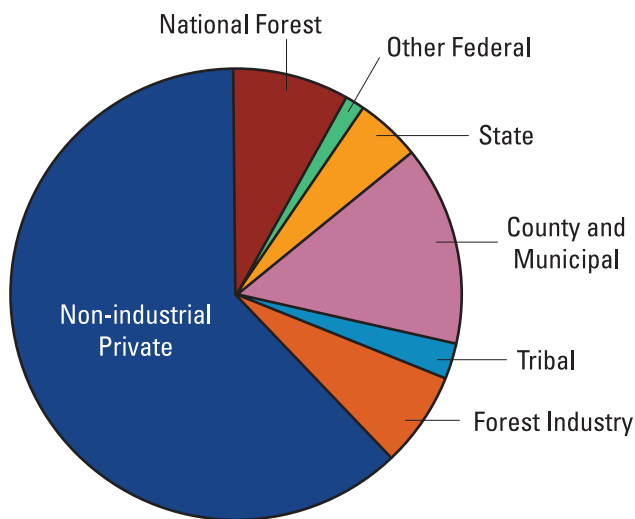


Figure 1-9: Forest acres by ownership category.

Ownership

Individual, private owners own the majority of Wisconsin forests – 57 percent. The state owns just five percent, and the federal government, 10 percent. In the public sector, counties and municipalities own the largest – 15 percent, followed by the forest industry (seven percent), private corporations (four percent), and tribal lands (two percent).

Ownership is increasingly important to Wisconsin forests. The demographics of Wisconsin forestland owners are changing, as are their values and goals for their land. The increase in second homes and non-resident landowners has resulted in more forest owners of smaller parcels. Lakeshore development is another trend related to this phenomenon.

This increase in second homes and non-resident landowners results in a significant increase in the number of individual private owners. Increased human presence in the forest has significant impact on the integrity of forest communities. Between 1984 and 1997, the number of Wisconsin's non-industrial private owners increased 20 percent to 262,000. Every year, an average of 3,385 new parcels are carved from Wisconsin's forestlands. As a result, ownership size is decreasing and development is increasing.



Figure 1-10: A lot for sale in Wisconsin's forestland.

Urban Forests

Many Wisconsin residents associate with urban forests. Urban forests surround people every day. The trees, lawns, landscape plantings, gardens, urban wildlife, and people of the cities compose the urban forest ecosystem. Wisconsin has about 1.7 million acres of urban forest, about 4.7 percent of the state's total land area. Statewide, the average urban canopy cover is 29 percent of the urban area. In the northern region, urban canopy cover is closer to 38 percent, in the south it is about 26 percent.



Figure 1-11: A home on lakeshore development.

A BRIEF HISTORY OF WISCONSIN'S FORESTS

Wisconsin's forests are reservoirs of vast ecological, economic and social wealth. Throughout Wisconsin's history, forests have played a primary role in supporting the people who have lived here. The forests of Wisconsin are dynamic, living systems that change with the human demands placed on them as well as through natural occurrences such as succession, severe weather events, fire, insect infestations, and disease.

Forests Before European/American Settlement

When the last glaciers receded from northern Wisconsin between 10,000 and 12,000 years ago, a complex array of habitats supported the colonization of plants, wildlife and humans. At the time of European/American settlement (1825 to 1880), forests stretched over most of the area that would become the state of Wisconsin. Between 22 and 30 million acres – 63 to 86 percent of the total land area of the state – were covered with forests. Two major forest divisions became apparent – the Northern Mixed Forest and the Southern Broadleaf Forest, each representing several ecosystems.

The native vegetation of the northern region is more cold-tolerant. Pine, spruce and tamarack are more abundant. Before European settlement, sugar maple, hemlock and yellow birch dominated the mesic forests of northern Wisconsin. Various pine species were also important. Aspen and white birch were important successional species that followed natural disturbance across northern Wisconsin. Acid bogs were a significant ecosystem in the northern Wisconsin forest. Pine forests and barrens were important on the sandy soils of central and northwestern Wisconsin. In the southern part of the state, oak-hickory and maple-basswood forests were especially prevalent. The southern and western parts of the state also supported oak savanna and prairie habitats. Forested and non-forested wetlands were found throughout the state (see Figure 1-13, page 8).

EARLY HUMAN INFLUENCE

There is evidence of human presence in Wisconsin as early as 11,000 years ago. The post-glacial ecology of Wisconsin was influenced by humans from its very beginning. The extent of that influence in times before European settlement is remarkable.



Figure 1-12: This old growth forest of pine, hemlock and northern hardwoods west of Minocqua is typical of the native vegetation that was found in northern Wisconsin before European/American settlement.

New research indicates that before European contact beginning in 1492, there were about two million people living in North America. In Wisconsin, 15th-century population is estimated between 60,000 and 70,000. From 1492 to 1634, the population was reduced to as few as 4,000 individuals, primarily as a result of introduced European diseases and war.

Especially prior to this population collapse, native people profoundly influenced the land and ecology of Wisconsin in areas where they lived. Perhaps most significant was their use of fire. It is thought that native people used fire throughout the state in varying degrees to encourage the establishment of favored plant and animal communities. Prairie and savanna were likely maintained by these fires.

Hunting and trapping also influenced the ecological communities of the area that later became Wisconsin. Native people hunted a broad spectrum of animals. Deer, fish and black bear were the cornerstone of the Woodland Indians' diet, but mussels, birds, fish, and more than 25 other mammal species were utilized as well. Many animal populations may have been limited by human hunting rather than by other carnivores or food supply.

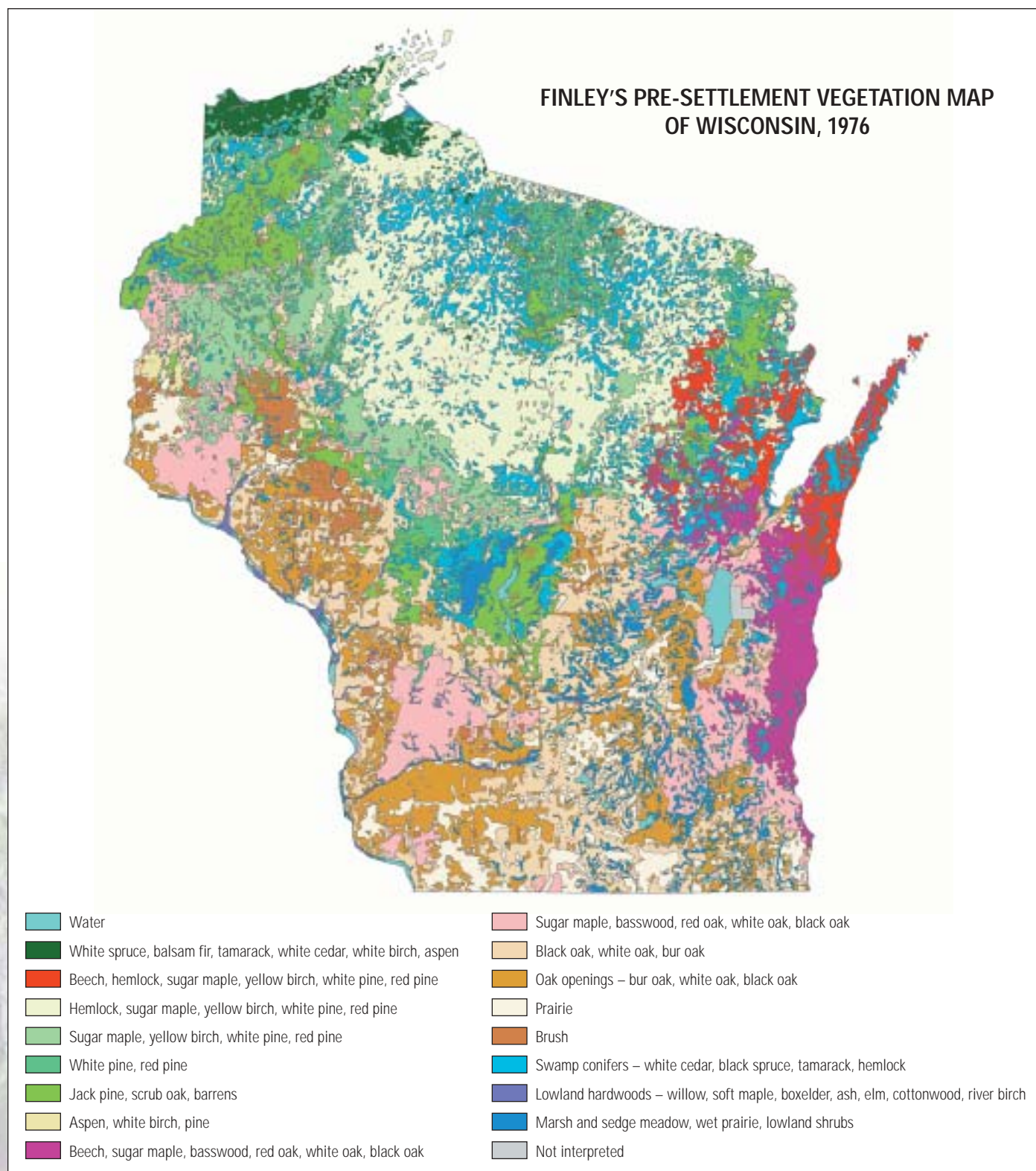


Figure 1-13: Original Vegetation Cover of Wisconsin by R. W. Finley (1976). Compiled from U.S. General Land Office Public Land Survey records. In Wisconsin, the majority of the survey was conducted between 1832 and 1866. It was the first statewide survey to collect quantitative and spatially-explicit vegetation data. This map represents very generalized vegetation cover at the time of survey, and just prior to major settlement by peoples of European/American descent.

Nuts and fruits were also important to native people, and there is evidence that they planted orchards to ensure a supply. There are accounts from early European explorers describing the “planted tree groves” of chestnuts, locusts, oaks, ashes, basswoods, beeches, cottonwoods, maples, pecans, medlars, mulberries, and plums. These “orchards” may have resulted in the forest islands seen on the prairies by early European explorers.

Foraging also influenced the ecology of Wisconsin. Collected plants may have become over-represented in biotic communities because of Indian dispersal. It was said of wild rice by the Menominee, “Whenever the Menominee enter a region, the wild rice spreads ahead; whenever they leave it, the wild rice passes.” Mining, trails, agriculture, and placement of settlements in pre-contact times had a large impact on the landscape. Many of our major highways began as roads between native people's settlements hundreds of years ago.

When early explorers arrived in Wisconsin in the 1630s, they found a greatly reduced population. Because of this, until recent archeological research contested the belief, it was assumed that there were very few people living in Wisconsin before European settlement. The forests early European explorers saw likely changed as

a result of the decrease in human population. Because there was no longer the need or capacity to burn or clear the land, many areas maintained by fire as grassland or early successional forest soon became mature forests.

The tribes living in Wisconsin in the mid-1600s included the Winnebago, Ojibwe, Menominee, Dakota, Potawatomi, Heron, Sauk, and Fox. However, some of these groups have stories of migrating from other areas to Wisconsin. For example, the Ojibwe tell of their migration from the eastern ocean in the 1400s. This era corresponds to the “Little Ice Age,” a period of significant cooling of the North American continent. Temperatures between 1450 and 1850 averaged 1.5°F cooler than today.

Forests Since European/ American Settlement

Today, Wisconsin's forests are significantly different than those before European/American settlement. A variety of historical reasons can account for this.

EXPLORATION AND SETTLEMENT

In 1634, Frenchman Jean Nicolet landed on the southern shore of Green Bay to arrange a truce between the Winnebago and their enemies so that the French fur trade would be protected, a task at which he succeeded. This was the first direct European influence felt on the land that would become the state of Wisconsin. However, for two hundred years, the forests remained sparsely settled while providing for the lucrative fur trade and continuing to support native people.

Various treaties in the early 1800s, which either removed or confined native populations, opened up Wisconsin to intensive European/American settlement. With the dramatic increase in human population came increasing demands on resources. Much of the southern part of the state was converted to agriculture. The fertile soil in this area, including much that was previously forested, became the base for some of the most productive farms in the growing nation. During this process, southern forests were cut and burned to aid in clearing the land and create nutrient-rich ash to fertilize crops. Timber was not a major economic contributor until the 1870s.



Figure 1-14: Prairies and savannahs were common native habitat in the southern and western parts of Wisconsin, and often maintained by the Native Americans use of fire.

THE CUTOVER

In the late 1860s following the Civil War, logging became an important component of Wisconsin's economy. By 1893, Wisconsin had reached its logging zenith and was a world leader in lumber production with more than 3.5 billion board feet produced annually. Pulpwood consumption was about 211,000 cords. Sawmills sprang up everywhere along Wisconsin's many rivers, which transported logs to the mill and finished products to burgeoning cities to the south and west.

In 1898, the federal government conducted and published a survey of Wisconsin's northern forests. By this time, a first wave of cutting was well underway, and a second wave beginning. In the survey's introduction, B. E. Fernow estimates the 1850s pine (red and white pine) volume at 130 billion board feet. By 1898, all but 17 billion had been removed, and cutting was continuing at a rate of two billion board feet per year. Fernow wrote, "In almost every town in this region, logging has been carried on, and 8,000,000 of the 17,000,000 acres of forest are 'cutover' lands, largely burned-over and waste-brush lands, and one-half of it as nearly desert as it can become in the climate of Wisconsin."

By the 1930s, most of the valuable timber in the northern area of the state had been removed or destroyed by fire. The harvest occurred in two waves; the pines were harvested first and floated down the rivers to cities to the south. When railroad shipping became available, valuable hardwoods were cut and taken by train to the south. Then the other, less economically-desirable trees were cut.

Harvest techniques varied in cutover lands. Some lands were clearcut, but most were high graded. The largest and most valuable trees were removed, often leaving species and individuals less dominant to re-seed an area. At the time of the first statewide inventory in 1936, the approximately 16 million acres of forestland in the state was primarily young, early succession second growth.

The Cutover led to a variety of problems for contemporary and future residents. Not least among the challenges was the wave of forest fires that cinched the destruction of millions of acres of trees, and took thousands of human lives. Slash (wood residue from logging operations) burned easily and quickly. Fires spread over large areas, leaving ashes in their path.

Another result of the Cutover was the land boom of the early 1900s. In northern Wisconsin, logging companies sold sizable tracts of cutover land to speculators who then sold smaller farms to the immigrant population arriving in Wisconsin, enticed by the promise of land. Farmers diligently removed stumps left from the Cutover, sometimes disposing of them through fire, which further contributed to frequent and intense forest fires of the era.



Figure 1-15: Eight million acres of forest were cut by 1898, the height of the Wisconsin Cutover.

CONSERVATION

This degradation of Wisconsin's forests did not go unnoticed. An era of forest conservation was about to begin. One of the most persistent advocates of conservation was E. M. Griffith, appointed the first state forester in 1904. With the help of people as disparate as Senator Robert LaFollette, Sr., lumber baron Frederick Weyerhaeuser, and University of Wisconsin President Charles R. Van Hise, Griffith pieced together land into state-owned forest preserves. He also oversaw construction of the first state nursery at Trout Lake near Minoqua, implemented new fire control strategies, and was influential in locating the U.S. Forest Products Laboratory in Madison.

Unfortunately, neither the public nor the Wisconsin Supreme Court was ready for such innovations. County governments were concerned about the loss of land from the tax rolls, and contended that Griffith and his cohorts were trying to turn northern Wisconsin into a "playground for the rich" at the expense of the farmers becoming established in the area.

The Supreme Court found that the land was purchased for the forest preserves under the authority of an improper amendment to the state constitution. Griffith resigned in 1915, and the reforms that he tried to promote were not implemented for another decade.

Finally, in the late 1920s and 1930s, some of Griffith's goals were realized. A new concern for conservation and an understanding that the forest resource is indeed finite formed new decisions regarding Wisconsin's forests. Farmers in the north realized the land and climate were not well-suited to agriculture. Many of them abandoned the land, bankrupt. This land reverted to forest.

The State Constitution was amended in 1924 to allow state funds to go to the acquisition, development and preservation of forest resources. The Northern Highland State Forest, still the largest state forest, was the first created under the new amendment. The Forest



Figure 1-16: Logjam on a river. Rivers transported much of the timber cut from Wisconsin forests in the late 1800s.

Crop Law, a precursor to the current Managed Forest Law, was passed in 1927, making it easier for private landowners and counties to conserve forest resources for future use. County forests were created from much of the tax delinquent land of failed farms. In 1928, the first national forest land was purchased in Wisconsin, creating what is now known as the Chequamegon-Nicolet National Forest.

After 50 years of pervasive forest fires, made worse because of the ready availability of fast-burning slash from the extensive harvesting, the public began to value fire control. Human life, farms, buildings, and forests were protected with new fire prevention and control measures. With the invention of Smokey Bear in 1944, the public embraced a commitment to fire prevention and forest conservation in Wisconsin.



Figure 1-17: The Civilian Conservation Corps fought fires, planted trees and contributed in substantial ways to Wisconsin's growing conservation ethic.

In the 1930s and early 1940s, a notable influence on Wisconsin's forests was the Civilian Conservation Corps (CCC). As in other areas, the "CCC boys" fought fires, planted trees, built park buildings, and worked on other conservation projects. Reforestation efforts commenced across the state, with the goal to renew the forests. Many of Wisconsin's older pine plantations originated with CCC efforts.

The Cutover era dramatically changed the composition, structure and function of Wisconsin's forests. The extensive logging and large fires allowed species like quaking aspen and paper birch to become prevalent, encouraging large populations of whitetail deer and other wildlife that thrive in early successional habitat.

A forest inventory of Wisconsin was conducted in 1936. It revealed a very young forest, with aspen-birch by far the most prevalent forest type. Many years passed before the cutover forests recovered sufficiently for harvest. Fortunately, by this time there was a better understanding of the need to conserve forest resources and employ sound forest management. In many instances, professional foresters from forest products companies and government agencies worked together to bolster the growing forests.

Since the Cutover era, Wisconsin's forests have recovered dramatically. The state now supports a wide array of healthy forest ecosystems. Ecological, economic and social benefits have grown with the growing forest. There are also challenges that face Wisconsin's forests including environmental issues, economic demands, and changing expectations among people who use and own the forests.

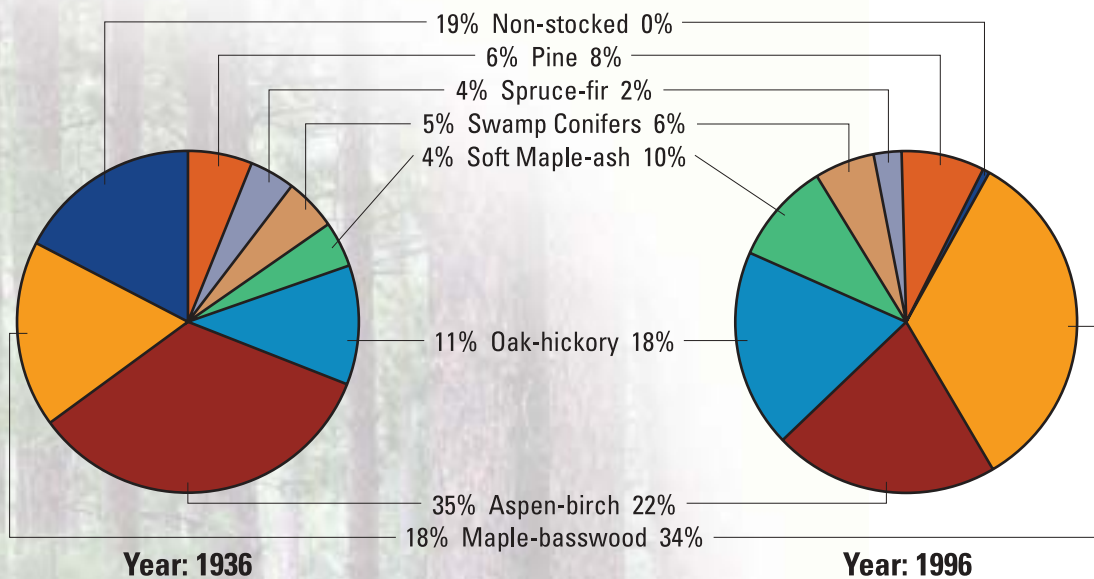


Figure 1-18: Wisconsin forest area by type in 1936 and 1996.